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NOTES ON GEOGRAPHIC DISTRIBUTION

New records for *Coatitermes pallidus* (Snyder, 1926) and *Coatitermes clevelandi* (Snyder, 1926) (Isoptera, Termitidae, Nasutitermitinae) from Amazonia

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Abstract. Seven new localities are reported for *Coatitermes pallidus* (Snyder, 1926) from Amazonia and nine for *Coatitermes clevelandi* (Snyder, 1926) from Amazonia and Panama. The soldier of *C. pallidus* and the worker enteric valve armature are depicted for the first time and compared with those of the sympatric *C. clevelandi*. The new localities extend the distribution ranges of both species by over 1,000 km.

Key words. Bolivia, Ecuador, enteric valve armature, Panama, Peru

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INTRODUCTION

The Neotropical termite genus *Coatitermes* Fontes, 1982 consists of four very small species: *C. clevelandi* (Snyder, 1926), *Coatitermes kartaboensis* (Emerson, 1925), *Coatitermes mazaruniensis* (Emerson, 1925), and *C. pallidus* (Snyder, 1926). The *Coatitermes* nasus is very broadly conical in dorsal view with a basal width more than one-third of the soldier maximum head width. The nearest Neotropical nasutitermitines with wide conical nasi are the larger soldiers of *Convexitermes* Holmgren, 1910 and *Paraconvexitermes* Cancello & Noirot, 2003.

Coatitermes pallidus was among 36 new termite species that were collected by W.M. Mann during the Mulford Biological Exploration of the Amazon Basin during 1921–1922 (Snyder 1926a). Snyder's soldier description was based on a series of soldiers and undescribed workers from Ivon and Cachuela Esperanza in northern Bolivia. Although the description by Snyder (1926a) included detailed measurements of the *C. pallidus* soldier, it was brief and lacked illustrations. No illustrations of *C. pallidus* have been published to date (Krishna et al. 2013; Constantino 2020).

Collecting expeditions to Bolivia (2013), Ecuador (2011), Panama (2005, 2010), and Peru (2014) have yielded over 5,300 colony samples, including many country records and numerous new termite species (Scheffrahn 2019). In this study, I present new records of *C. pallidus*, illustrate this species for the first time, and make a comparison with a sympatric congener, *C. clevelandi*.

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METHODS

Termites were aspirated from foraging areas in soil or nests of other termite species and preserved in 85% ethanol. All samples are housed in the University of Florida Termite Collection (**UFTC**), Davie, Florida (Scheffrahn 2019). Soldiers were photographed as multi-layer montages using a Leica M205C stereomicroscope controlled by Leica Application Suite v. 3 software. The enteric valve armatures (EVAs) of workers were mounted on slides with PVA mounting medium (Bioquip Products, Inc.) and photographed with a Leica CTR 5500 compound microscope using bright field lighting and the same montage software. The *Coatitermes* locality map (Figure 1) was prepared using ArcGIS Pro Intelligence v. 3.0 (Redlands, CA, USA). Field photographs of live subjects were taken with a Nikon Coolpix S7c digital camera.

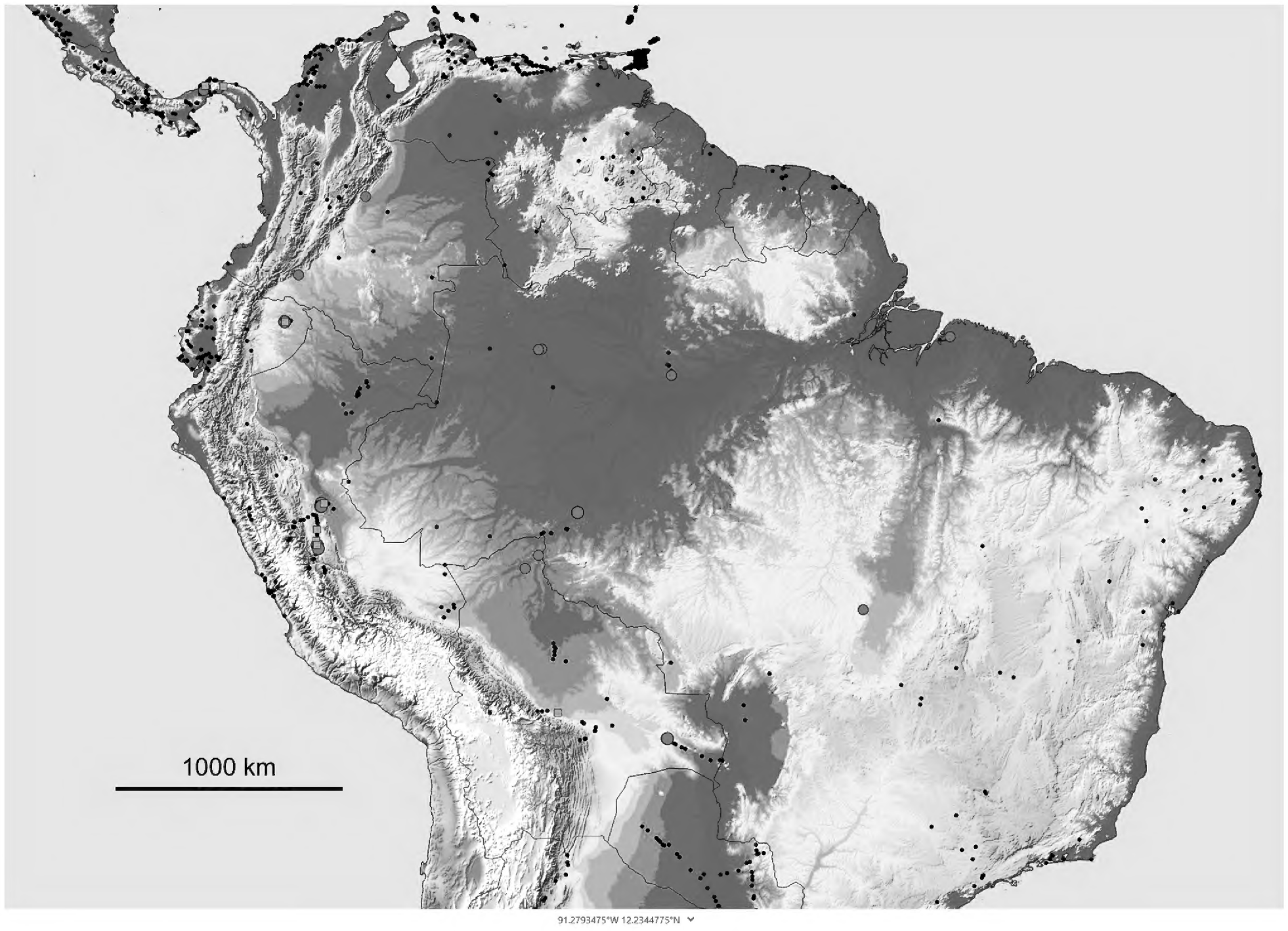

Figure 1. Locality map of *Coatitermes pallidus* [red circles are new localities (UFTC), and orange circles are literature records] and *Coatitermes clevelandi* from the UFTC included herein [yellow squares are new localities (UFTC), and purple circles are literature records]. Small black circles are all UFTC localities.

RESULTS

Coatitermes pallidus (Snyder, 1926)

New records. BOLIVIA – Santa Cruz Department • Chochis; −18.107, −060.086; 31.V.2013; 510 m elev.; A. Mullins leg.; 3 soldiers 5 workers, BO772; six soldiers, many workers, BO805.

ECUADOR – Orellana Province • Parque Nacional Yasuní; −0.6718 −076.3980; 28.V.2011; 223 m elev.; R.H. Scheffrahn leg.; many workers, many nymphs with Anoplotermes parvus, EC431; many soldiers, many workers, many nymphs, and one queen with Rotunditermes bragantinus, EC543.

PERU – Pasco Province • 28 km S. Ciudad Constitución, old growth forest; −10.107, −075.020; 27.V.2014; 266 m elev.; J.A. Chase leg.; many soldiers, many workers, PU343 – Oxapampa Province • 4 km NW Pto. Bermudez, old growth forest; −10.268, −074.965; 27.V.2014; 283 m elev.; J.R. Mangold leg.; many soldiers, workers, PU422 – Ucayali Province • 34 km W Pucallpa, farmland; −8.370, −074.844; 29.V.2014; 186 m elev.; T.F. Carrijo leg.; many soldiers, many workers, many nymphs, PU615 • 6 km W Campoverde; −8.489, −074.858; 29.V.2014; 204 m elev.; R. Constantino leg.; many soldiers, many workers, PU669 • 5 km SW Campoverde, farm area; −8.502, −074.846; 29.V.2014; 205 m elev.; E. Kuswanto leg.; 6 soldiers, many workers, PU711.

Identification. The lack of a soldier head-capsule constriction for *C. pallidus* (Figure 2A) separates this species from *C. clevelandi* (Figure 3A). In his soldier comparison with *C. pallidus*, Snyder (1926b: 15–16) noted that *"clevelandi* has a less robust nasus than *pallidus* Snyder from Bolivia, the front of the head at the base of the nasus is less elevated, and the third segment of the antenna is relatively longer" and that the head capsule of *C. clevelandi* was "slightly constricted back of antennae". This constriction was also depicted by Fontes (1982: fig. 15), Nickle and Collins (1992: fig. 13.98), and Roisin (1995: fig. 5). In the field, the nasus of *C. pallidus* (Figure 2D) is noticeably darker than that of *C. clevelandi* (Figure 3D).

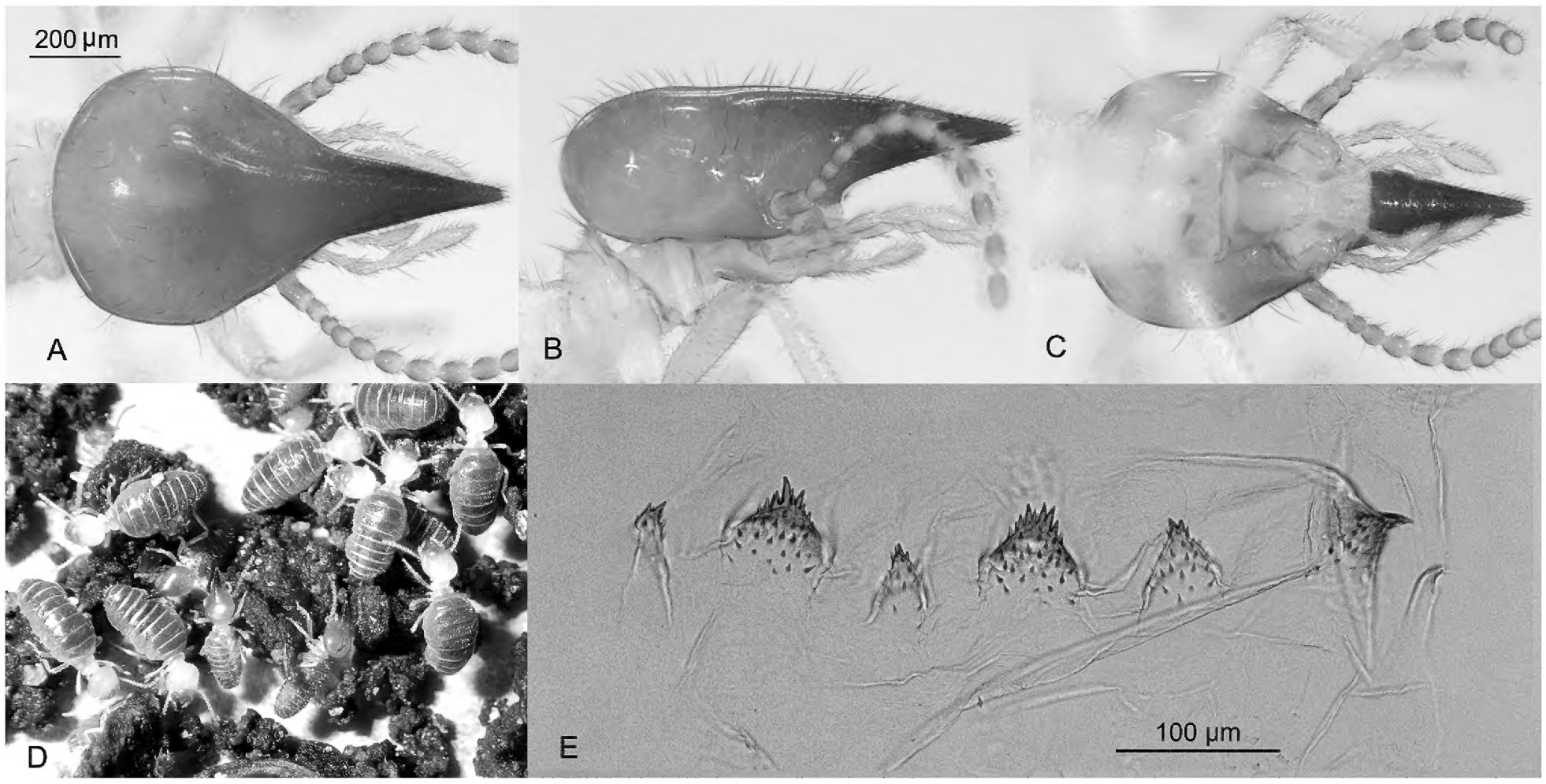

Figure 2. The *Coatitermes pallidus* soldier head capsule from Ecuador (EC433). **A.** Dorsal, **B.** lateral, and **C.** ventral aspects. **D.** Field habitus. **E.** Worker EVA.

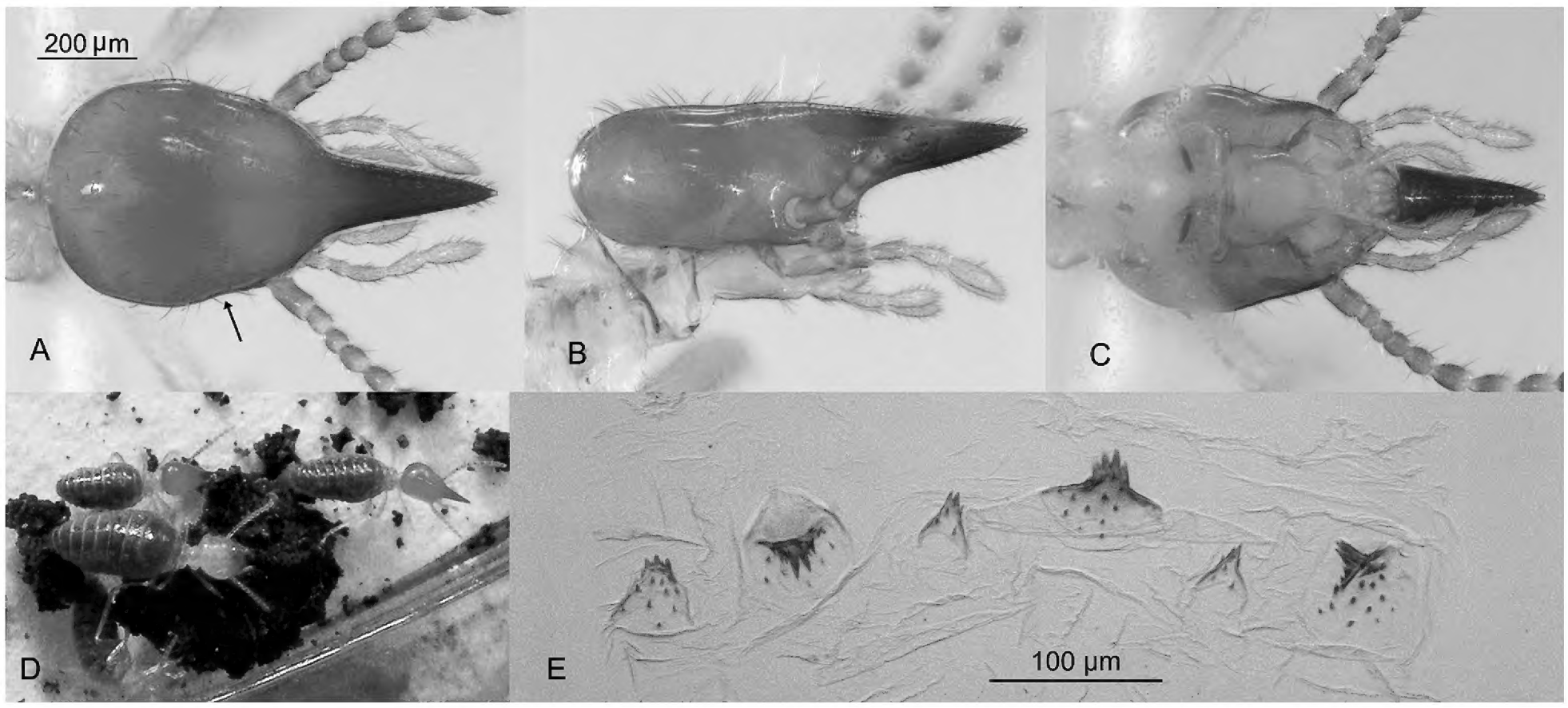

Figure 3. The *Coatitermes clevelandi* soldier head capsule from Peru (PU277). **A.** Dorsal (arrow denotes constriction), **B.** lateral, and **C.** ventral aspects. **D.** Field habitus. **E.** Worker EVA.

Coatitermes clevelandi (Snyder, 1926)

New records. BOLIVIA – Cochabamba Department • Iviganzama; −17.056, −064.760; 27.V.2013; 232 m elev.; R.H. Scheffrahn leg.; 3 soldiers, many workers with Subulitermes baileyi, BO237. ECUADOR – Orellana Province • Parque Nacional Yasuní; −00.672 −076.398; 30.V.2011; 223 m elev.; J. Křeček, leg.; many soldiers, many workers, many nymphs with Anoplotermes parvus, EC442 • bank of Tiputini River; −00.667, −076.375; 1.VI.2011; 230 m elev.; R.H. Scheffrahn leg.; many soldiers, many workers, many nymphs, EC1107. PANAMA – Colon Province • Sierra Llorona, Los Nances trail; 09.342 −079.774; 2.VI.2005; 187 m elev.; R.M. Giblin−Davis and N. Kanzaki leg.; many soldiers, many workers, PN518 • Sierra Llorona, Los Monos trail; 09.343, −079.774; 4.VI.2005; 187 m elev.; R.H. Scheffrahn leg.; many soldiers, workers, alates in nest of Embiratermes chagresi (Figure 4), PN754 – Guna Yala Province (formerly San Blas) • Kuna Rd stop 2; 09.320, −078.999; 5.VI.2010; 411 m elev; 1 soldier, many workers with very small apicotermitine, PN1394. PERU – Oxapampa Province • 41 km N. Pte. Bermudez; −09.937, −075.050; 27.V.2014; T. Nishimura leg.; many soldiers, many workers with Embiratermes neotenicus, PU277 – Pasco Province • 28 km S. Ciudad

Figure 4. One *Coatitermes clevelandi* colony (PN754) containing many soldiers, imagos, and workers were living in this *Embiratermes chagresi* (Snyder, 1925) nest in Sierra Llorona, Panama.

Constitución, old growth forest; −10.107, −075.020; 27.V.2014; 266 m elev.; J.A. Chase leg.; many soldiers, many workers, with Subulitermes microsoma, PU342 – Huánuco Province • 11 km SW Puerto Inca, secondary forest; −09.468, −075.024; 28.V.2014; 280 m elev.; J. Křeček leg.; many soldiers, many workers with Agnathotermes sp., PU455 – Ucayali Province • 21 km W Pucallpa, farmland; −08.367, −074.718; 29.V.2014; 152 m elev.; A. Mullins leg.; 1 soldier, many workers, PU552.

Identification. See identification section for *C. pallidus* above.

Diagnosis. The worker EVA of *C. pallidus* consists of three major cushions with about 20 small basal spines and a crown of six to eight larger spines (Figure 2E). The three smaller less sclerotized EVA cushions of *C. pallidus* consist of a larger one with about 16 small spines and three or four crown spines and two smaller cushions with about 10 small spines in total. The EVA of *C. clevelandi* was partially drawn by Fontes (1987: fig. 60) and photographed through muscle tissue by Roisin (1995: fig. 24). The EVA of *C. clevelandi* consists of three major cushions with 8–10 small basal spines and a crown of four or five larger spines (Figure 3E). The three smaller less sclerotized EVA cushions of *C. clevelandi* consist of a larger one with about eight small spines and three or four crown spines and two smaller cushions with about eight small spines in total.

DISCUSSION

The ranges of *Coatitermes pallidus* and *C. clevelandi* and are extended by 1,630 km and 1,400 km respectively (Figure 1). *Coatitermes clevelandi* is the only small monomorphic nasutitermitine from Panama that has an extended range into Amazonia (Table 1, Figure 1).

The *Coatitermes* worker EVA morphology (robust armature) and gut contents verify that the genus is humivorous. *Coatitermes* spp. may often inhabit earthen nests built by other species including *Embiratermes chagresi* (Snyder, 1925) (Figure 4), *E. neotenicus* (Holmgren, 1906), *Anoplotermes parvus* Snyder, 1923, *Constrictotermes cavifrons* (Holmgren, 1910), *Rotunditermes bragantinus* (Roonwal & Rathore, 1976), and *Subulitermes microsoma* (Silvestri, 1903) (Scheffrahn 2019). *Coatitermes* spp. usually forage at the interface of decaying wood and soil or in rotted tree stumps; this is they belong to Group III feeders per Donovan et al. (2001).

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Table 1. University of Florida Termite Collection records and literature localities for *Coatitermes clevelandi and Coatitermes pallidus* used to construct Figure 1.

Code	Country	Locality	Latitude	Longitude	Elev. (m)	UFTC no.[1] or Reference
Coatitermes clevelandi						
UFTC	Bolivia	Iviganzama	−17.056	−064.760	232	BO237
Lit.	Brazil	Matto Grosso, Xavantina	−12.817	−051.760	309	Mathews 1977
Lit.	Brazil	Amazonia, Japurá River	−01.833	−065.450	72	Constantino 1991
Lit.	Brazil	Maraã	−01.861	−065.590	45	Constantino 1992
Lit.	Brazil	Pará, Benevides	−01.306	−048.056	41	Constantino and Cancello 1993
Lit.	Brazil	Reserva Ducke	−02.959	−059.926	91	Dambros 2010
Lit.	Colombia	Mesa de San Pedro	04.650	−072.950	374	Florian et al. 2017
Lit.	Colombia	Caquetá	01.330	−075.800	261	Duran-Bautista et al. 2020
UFTC	Ecuador	Yasuni station area, all trails	−00.672	−076.398	223	EC432, EC787
UFTC	Ecuador	Tiputini river, stop 1	−00.667	−076.375	230	EC1107
UFTC	Panama	Sierra Llorona Los Nances trail	09.343	−079.774	187	PN518
UFTC	Panama	Sierra Llorona, Los Monos trail	09.343	−079.775	216	PN754
UFTC	Panama	Kuna Rd stop 2	09.320	−078.999	411	PN1394
Lit.	Panama	Barro Colorado Island	09.150	−079.850	100	Snyder 1926a
UFTC	Peru	41 km N. Pte. Bermudez	−09.937	−075.050	263	PU277
UFTC	Peru	28 km S Constitucion	−10.107	−075.020	266	PU342
UFTC	Peru	11 km SW Pto. Inca	−09.468	−075.024	280	PU455
UFTC	Peru	21 km W Pucallpa	−08.367	−074.718	152	PU552
Coatitermes pallidus						
UFTC	Bolivia	Chochis	−18.107	−060.087	510	BO772
Lit.	Bolivia	Ivon	−11.110	−066.140	132	Snyder 1926b
Lit.	Bolivia	Cachuela Esperanza	−10.540	−065.580	119	Snyder 1926b
UFTC	Brazil	Porto Velho	−08.760	−063.909	86	MZUSP 19385[2]
UFTC	Ecuador	Yasuni station	−00.672	−076.398	223	EC431 EC543
UFTC	Peru	4 km NW Pto. Bermudez	−10.268	−074.965	283	PU422
UFTC	Peru	34 km W Pucallpa,	−08.370	−074.844	186	PU615
UFTC	Peru	6 km W Campoverde	−08.489	−074.859	204	PU669
UFTC	Peru	5 km SW Campoverde	−08.502	−074.845	205	PU711

[1]New localities.

[2]Museu Zoologia da Universidade de São Paulo, São Paulo, Brazil.

ADDITIONAL INFORMATION

Conflict of interest

The author declares that no competing interests exist.

Ethical statement

No ethical statement is reported.

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Data availability

All data that support the findings of this study are available at https://www.termitediversity.org.

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